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BULLETIN 245. JANUARY, 1907.

MICHIGAN

STATE AGRICULTURAL COLLEGE

EXPERIMENT STATION

FARM DEPARTMENT

POULTRY RAISING

BY

J. G. HALPIN

AGRICULTURAL COLLEGE MICHIGAN
1907

The Bulletins of this Station are sent free to all newspapers in the State and to such individuals interested in farming as may request them. Address all applications to the Secretary, Agricultural College, Michigan.

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BULLETIN 245. JANUARY, 1907.

POULTRY RAISING.

BY JAMES G. HALPIN.

INTRODUCTION.

There has been a constant demand throughout the State, from beginners in the poultry business and others, for information relating to poultry raising. This bulletin has been prepared expressly to meet this demand. The aim is to make a presentation of the subject in as practical a manner as possible, dealing only with the most elementary problems. At the present time, however, plans are being developed and experiments conducted to investigate the more intricate problems, many of which the individual producer has neither the facilities, time, nor means to solve. During the present year the poultry division has been reestablished with new buildings, colony houses, brooders, yards and other equipment, as shown in illustration number one. The poultry house proper consists, at present, of a building 15x84 feet with a 4-foot alley along one side and seven pens each 12 feet wide. Each pen is intended to accommodate from twenty to twenty-five breeding fowls. The building has been so planned and located that further additions, which even now seem desirable, can be easily made. The incubator house 18x36 feet has a half basement with capacity for operating from ten to fifteen large machines. The floor above is intended for instruction, demonstration and experimental purposes.

SELECTION OF PARENT STOCK.

HEALTH AND VIGOR ESSENTIAL.

In order to obtain fall and winter eggs we must have stock produced from the eggs of healthy, vigorous fowls. A fowl which has suffered, or is suffering from disease, should not be allowed to produce offspring. Although, in some cases, chicks from the eggs of unhealthy fowls succeed in getting out of the shell in fairly good form, in the end they almost invariably prove unsatisfactory. It is fortunate that the eggs from diseased fowls are seldom fertile, otherwise there would be more unthrifty birds in existence. The offspring from a "roupy" hen is not

likely to inherit this disease, but is liable to have a weak constitution and thus fall an easy prey to roup or some other malady. Small, lazy, worthless individuals in the flock are usually from parent stocks which have been affected by disease. One of the first things to do then is to discard all fowls that are not strong and healthy.

PROPER FOOD, EXERCISE, ETC.

In order to have a healthy, vigorous flock they must be provided with the proper amount and variety of food, plenty of fresh, clean water, good pure air, and exercise when under confinement. It is not our purpose to enter into a discussion of feeding here, but merely to say that fowls should have a variety of grains, fed regularly, with proper care as to quantity. Exclusive rations of corn should not be expected to produce eggs that will hatch vigorous, thrifty chicks. But good results should be secured from a mixture of grains, such as corn, wheat and oats, fed in connection with a mash feed composed of such materials as bran, middlings, corn meal and beef scrap, to which green food is added unless the fowls have access to a grass range. If the range supplies a good many insects the beef scrap need not be fed. Judgment must be used, as no absolute rule for feeding can be given. Owing to the freedom fowls enjoy in and about the farm yard and the great variety of suitable food secured, there is less necessity for the purchase of commercial foods on the farm and the formation of highly artificial ration, than in the case of the village or town producer.

SELECT NATURAL AND WELL DEVELOPED PRODUCERS.

A hen suitable to become the mother of the future laying stock should be a good producer herself, and one fed to stimulate production. Among all classes of domestic animals we find some that are naturally prolific, while others in the same flock or herd possess this quality in greatly varying degrees, a few being absolutely sterile; the same is true of poultry, some hens are abundant layers, while others equally well fed and cared for are almost worthless. The prolific layer is the one that should be saved for the parent and fed to lay, as we believe that a hen which has been fed and stimulated to lay a large number of eggs is more likely to produce offspring possessed of the same quality, than one equally well fitted by nature to produce, but which, owing to poor care or neglect has not laid many eggs.

EARLY LAYERS.

Frequently a pullet starts laying before the others and continues to lay well all the year; such a one should be carefully watched and her eggs saved, providing sufficient size was attained before she began laying. Other pullets will lay a few eggs in the autumn and then cease until spring; these should, of course, be discarded. Those that begin laying prematurely are not desirable, as they should attain the size characteristic of their breed before commencing, and then lay continuously during the rest of the fall and winter. Pullets of the smaller breeds frequently begin laying at five months of age, but these are usually too small and although they may lay constantly, are not large

enough, or strong enough, for parent stock. Select the pullet that grows to a good size quickly and lays continuously for a long period.

SELECTION ACCORDING TO FORM.

Many rely on selecting their best laying fowls by merely studying the form, or in other words, they believe that there is a characteristic egg type. Trap nest records seem to indicate that this rule is variable to some extent, at least. One should be able to select by form with fair success, as it has been noticed that hens with crow heads, that is, long, peaked heads, are seldom good layers. The same is true of hens that are unusually long legged. All those that are crooked breasted, or in any way deformed, should be discarded, not for fear that the chicks will inherit the deformity, but because it shows weakness; a bird with a crooked breast cannot present a very good appearance on the stand in the market. It is essential, however, to know by form and type which ones should be kept. Some of the most important factors relating to form, aiding in selection, are embodied in the following: A triangular shape, with deep, broad bodies, showing a large capacity for egg production, well sprung ribs and flat backs that broaden out toward the rump. Some claim that they can readily tell the good producers by a large space between the pelvic bones. Careful examination of a number of hens will show that in some cases, at least, there is a variation in the distance between these bones.

SELECTION OF GOOD FEEDERS.

The appetite of the hen is some indication as to her productive capacity. Those with good appetites will meet one at the door at feeding time and, if at all tame, may hop on to the feed basket. They will scratch the litter about the pen in a vigorous way in search of hidden grains, and may be heard singing away contentedly as they work. They will always be active, never drooping around the pen or staying on the roosts after the others have left, in fact, the first hen about in the morning may usually be considered one of the best producers. The reason for this is simple. If she requires just food enough to supply the wear and tear of the body it will not take her long to secure it, but if she is a good egg manufacturing machine, a large supply of fuel is needed to keep the mechanism running. The fuel furnishing this energy is found in the food consumed.

SELECTION AND AGE.

A question that attracts considerable attention relates to the age of the hens to produce eggs for incubation. Many people disapprove of eggs from pullets, but we believe those secured from pullets that have laid all winter and from yearling hens with good records are the most satisfactory. Extra good producers may be kept for breeding stock until their third or fourth year, or even longer, but usually hens coming two years old make the best breeders. But if hens have extra good records they should be kept as long as they continue to do well. It would be a decided advantage if we could breed hens capable of maintaining a high standard of production for several years. All of the

large farms specializing in egg production would gladly pay an extra price to secure foundation stock that could be used profitably for several years. On many of these farms chicken raising is a great trouble and expense; the cockerels are considered a by-product to be disposed of as soon as possible. Hens bred especially to lay which do well for one year only should be fattened.

MATING.

Having selected the hens that are suitable to produce eggs for hatching, see that they have good, clean, comfortable quarters, with plenty of fresh air, and all the sunshine possible. Mate them with a good, strong male which comes from productive ancestry. The male is half the flock and if his dam and granddams were producers of two hundred eggs per year he should be worth much more as a sire than one whose dam produced but half that number. The question is often asked, how many hens should be mated with one male? This varies with the individual and the breed. The best results are usually obtained by keeping about fifteen of the American class (Plymouth Rocks, Wyandottes, etc.) with one male, while with Mediterraneans (Leghorns, Minorcas, etc.) one may keep as high as twenty-five, while in special instances as high as fifty have been known to give strong fertile eggs from one male. The Asiatics (Brahmas, Cochins and Langshans) are not as active and usually from seven to ten is about the proper number. Having allowed the male to run with the flock for a couple of weeks, it is safe to begin saving eggs for hatching.

EGGS FOR HATCHING.

One should be as careful in selecting eggs for hatching as in selecting parent stock. Choose medium to large eggs, as nearly perfect in shape and color as possible. Uniformly colored eggs look much better than a mixed lot and will usually sell better. Some select the short, round eggs, believing these will produce a large percentage of pullets; but the shape of the eggs has nothing to do with the sex of the chick. Continuous selection of the roundest eggs will gradually produce a strain of hens that will lay round eggs of imperfect shape. Some hens habitually lay eggs flattened on one side, others lay long, pointed ones, while still others lay those with porous, crumbly shells; such hens should be removed from the breeding pens as soon as discovered.

SHIPPING EGGS FOR HATCHING.

In shipping eggs for hatching, great care must be taken to prevent injury in transit. There are several methods of packing eggs: one is to place them in an ordinary shipping crate and fill all the spaces between the eggs and cardboard with sawdust. Another good method is to wind a small bunch of excelsior around each egg and pack so snugly in a basket or box that they cannot move about. Upon arrival, the eggs should be put in a room kept at an even moderate temperature and allowed to remain undisturbed for at least twenty-four hours, when the package may be opened and the eggs placed under the hens or in the incubator. Because of the rough handling to which eggs are subjected

in shipping a rest of twenty-four hours is needed to enable them to assume a normal condition and to permit the germs to swing back in place before incubation begins. If the misplaced germs start to grow, a large percentage of them will die during the period of incubation.

STORING EGGS FOR HATCHING.

In general, eggs cannot be set the day they are laid. Place them in a room where the temperature is fairly constant and at about 60° F. Turn them carefully at least once a day. If the air is very dry, sprinkle the floor with water, or place a few pans of water in the room, otherwise there may be a rapid evaporation of moisture from the egg, leaving a big air cell in the large end of it. One can readily determine the amount of evaporation by marking the air cell while holding the egg in a ray of light passing into a darkened room and then examining it again in the same manner after a couple of days. There should be a very slow increase in the size of the air cell. Eggs intended for incubation should be kept no longer than is absolutely necessary. Two weeks is about as long as it is safe to keep them, although with good care, under proper conditions, they may be kept longer. The fresher the egg, the more likely it is to hatch a good strong chick. Many farmers practice setting the eggs from one day's laying, which is not objectionable providing proper care has been exercised in sorting the flock to secure sufficient eggs of uniform size and color.

When the hens all run together and the finest shaped eggs from the whole flock are chosen, increased egg yields cannot result, as the chances are that some of the hens that have been laying well all the fall and winter are now ready to sit. Those that have not laid for months are the most likely to do so for a few weeks in the spring, and often produce fine large eggs, due, perhaps, to their long winter's rest. The use of eggs from such hens can only result in deterioration of the flock.

INCUBATION.

NATURAL OR ARTIFICIAL INCUBATION.

After selecting the eggs they must either be entrusted to hens or an incubator; this must be decided according to circumstances. If it is not the intention to keep many hens or raise early chicks, by using one of the heavier breeds of fowls, one can get along very well without an incubator. Some poultry raisers claim they can care for a machine with less trouble and expense than the necessary hens, no matter what breed they may keep. One thing is certain, however, the machine will bring off chicks at any season of the year that may be desired, while one must wait until the hens get ready to sit. If Leghorns or other non-sitting breeds are kept, an incubator is an almost indispensable part of the equipment. Some individuals of non-sitting breeds may make good mothers, but so many of them cease sitting after the first few days that they are very unsatisfactory, as a rule. If individuals of other

breeds as Cochins, Wyandottes, etc., seem inclined to sit and would make good mothers, they may be used, providing chickens are wanted at that time. It is claimed that the hen's time is too valuable to waste in sitting, but if she is properly cared for while broody, it will serve as a resting period, and she will probably lay about as many eggs in the year as she would if confined to the coop for a few days to break up the desire to incubate. After a hen has hatched and reared a brood of chicks she will usually begin laying again and apparently seem to try to make up for lost time. It is a mistake to kill a hen just because she raised a brood of nice chicks. She probably will be one of the best layers the next winter. Some hens, however, seem to be chronic sitters: these are of little value for anything but hatching chicks and might as well be killed if they are not wanted for that purpose. Such hens develop but few eggs at a time and can never make a good year's record.

BREEDS ADAPTED TO INCUBATION.

The question of the relative merits of the different breeds as sitters often arises. There is much difference of opinion on this subject and also a great difference in the individual hens themselves. In general, however, the Cochins and Wyandottes make very good sitters. Some may prefer Plymouth Rocks, Rhode Island Reds, etc., but we believe that no other breeds are as nicely feathered for incubation purposes as the Wyandottes and Cochins. It is generally conceded that Leghorns, Minorcas and others of the special egg producing breeds do not make good mother hens. Some of these make good sitters, but far too many will prove worthless for the purpose.

THE NEST.

In the first place one should select a good location for the sitting hen. When they are located where others can lay in with them, trouble is sure to occur, as they generally quarrel over the nest, thus breaking and soiling the eggs. Therefore, it is essential to secure a place where there cannot be any possibility of disturbance. The nest may be made of soft hay sprinkled with sulphur and powdered tobacco stems, or some other good insect powder to prevent the ravages of lice. After nightfall select those hens that have been sitting steadily for a few days and remove them to the prepared nests. If they do not settle down contentedly at first do not entrust them with eggs, until safe to do so. Some hens prove too cranky to be profitable even though they do not cease incubation entirely, or spoil the nest of eggs; they should be taken off the nest and fed once or twice to test their dispositions. If they go back on the nest of their own accord it is safe to entrust them with eggs. If they do not go back at the end of half an hour, catch and place them gently on the nest. Some hens learn to go back quickly and take their own nest, while others are very slow.

A very serviceable nest is made by cutting a door in the side of a barrel and hinging it fast with light hinges or straps. Place old newspapers on the bottom and then make a nice firm nest of soft hay. Be sure and make the nest so large that the eggs will not pile up on each other under the hen, but not large enough to allow them to roll away from her body. The top of the barrel can then be covered with boards,

old sacks or anything of the kind convenient. The top hoop may be removed and a sack fastened down the same as in shipping potatoes to market in barrels. Small holes can be bored in the side to admit plenty of air. Good nests may be made from boxes about 15″x15″x15″. Remove one side with the exception of a 6″ piece at one edge which serves as the bottom of the nest on the front side and holds the nest material in place. Hinge the part removed to one edge, thus making a door that can be quickly opened or closed. Nests of this style may be made in sections of five or six and placed one above the other, when one has to be economical of space. A small room may be lined around next to the wall with such nests and the blank space in the center left for feed and water dishes.

FOOD AND MANAGEMENT OF SITTING HENS.

If the hen is well disposed and can be left to come off the nest at will, little or no trouble is involved. If for any reason the hen has to be confined to the nest she should be taken off regularly once a day and allowed to eat and drink. Good sound corn is about the best food for sitting hens, although they may be fed such grains as wheat, oats, barley, or buckwheat. Rye is not recommended, as the hens do not like it and it does not prove to be a very healthful food for them. Grit, in the form of coarse sand or broken stone, should be kept convenient. Water must also be supplied. If the weather is hot, keep water inside the nest so that the hen can drink whenever she desires. Otherwise she becomes very thirsty and drinks too much at once, often resulting in bowel trouble and diarrhoea. Some take the hens off the nest in the morning and allow them a little run in the wet grass. In that way the hen's feathers become moistened slightly, thus adding a little moisture to the eggs each day. If the nest is in an extremely dry place moisture should be added in some way. There are several ways of keeping the eggs sufficiently moist. The practice of allowing the hens to run in the wet grass each morning is one of the best. Another is to place damp earth and sods under the eggs. A third method, and one probably most largely used, is to sprinkle or dip the eggs in water heated to 103° F. This is done at least twice, once about the 14th and again the 18th day of the hatch. If the eggs are on the ground or in a damp place no moisture should be added. When removing the hens from the nest, handle them carefully. Many good hens are spoiled by careless or rough handling. If the hen has to be caught in order to put her back on the nest do not place her directly on the eggs but on the edge of the nest, thus allowing her to cover them in her own cautious way.

PRECAUTIONS AGAINST LICE AND MITES.

Sitting hens must be kept free from lice and mites. In order to rid them of these pests take each one gently by the legs and with the head hanging downward, dust the feathers well with some good insect powder (see page 120) and replace on the nest. This should be repeated about the 10th and 18th days of the hatch. Attention to lice at this period may save many chicks later in the season. A hen cannot be a satisfactory sitter if she is infested with lice. Very often those that are well fitted by nature for good mothers are driven from the nest by

insect pests. The lice running around over the body and gnawing at the skin and feathers cause intense itching and in trying to get away from these pests the hen forgets all about her desire to sit and deserts the nest. If strongly inclined to sit she may desert one nest and move to another, trying to escape her enemies. If a hen shows any sign of uneasiness be careful to inspect her body for lice and also the cracks and crevices about the nest for mites. If either is found, thoroughly dust her once more, sponge off the eggs with a damp cloth and move to a clean place. Burn everything about the nest and either thoroughly disinfect or burn it. Wage constant warfare against lice and mites during the period of incubation and the result will be a clean lot of chicks. It has been said that three lice will break up a sitting hen or kill a brood of chicks. This probably is not always true, but it is certain that a hen that starts to incubate with three lice on her body will probably have enough by the end of the hatch, unless properly cared for to infest all the chicks and render the whole brood either very unsatisfactory, or worthless. An ounce of lice powder at the beginning of the hatch is worth a good many pounds after the chicks are a few weeks old.

ARTIFICIAL INCUBATION.

The selection of an incubator is one of the most difficult problems confronting the beginner. There is no make of machine that is better in every respect than all others. Some people seem to do better with one make of machine, while the success of others is secured through the use of another sort. There are a lot of good machines on the market and we should try to select one of these, even if the price is a little higher. It costs more to build a good machine than it does to fasten a lamp onto a single walled box, but the good machine will soon save the extra cost by hatching more of the fertile germs and saving in time and temper. A well-constructed machine is also less likely to take fire. Any of the better machines can be safely operated by anyone who is careful enough to be allowed to clean and care properly for kerosene lamps.

Having decided to buy a machine, write to the companies that advertise in your papers. Do not depend too much on testimonials as successful experiences only are related. Testimonials are most valuable when they come from some one in reputable standing in the poultry business. If some friend or neighbor already has an incubator go and see it and get all the information possible relating thereto. He perhaps has seen or used other machines and can, therefore, advise concerning them. Most of the companies have agencies in the larger towns, and one can see the machines there. Buying from a local firm saves freight, and may prove more satisfactory in other ways.

The best place to operate an incubator is often a perplexing question on the farm. A great many find the cellar to be the most suitable place, and it will answer if it will keep vegetables and apples without molding. The dining room or kitchen is sometimes used, but the variation in temperature is often too great to give satisfactory results. Although a properly constructed machine will do good work with a little care, where the range of temperature amounts to more than 20° F., a less varying temperature will be found more satisfactory.

Having decided where to run the machine, unpack and set it up carefully, according to the accompanying directions. Before starting see that the machine is level. If the floor is uneven or sloping, block up under the legs with pieces of shingle or blocks of wood. Choose a place in the room that is free from draughts or sudden gusts of wind which may blow the lamp out, or start it smoking. Direct sunlight should not fall on the machine for any length of time, yet the room should be reasonably well lighted and ventilated. Proper ventilation is necessary as the unhatched chick requires air in order to develop properly.

Use nothing but the best grade of lamp-wicks and oil. Be sure that the incubator lamp burns with a flame such as is desired in an ordinary house lamp. If the lamp smokes a little at first do not be alarmed, but allow it to warm up and dry out. When starting, screw the thermostat nut down until the rod almost, but not quite, lifts the damper. In this

A SUCCESSFUL HATCH AT M. A. C.

way the risk of breaking the thermometer which usually registers but 110° F. is avoided. On returning to look at the machine one should find the damper raised, if so and the temperature is not up to 100° let it down and so on until the machine registers 103° with an ordinary flame. The thermometer is a very important part of a machine and should be taken to a druggist or some one having correct thermometers and tested for accuracy. Although nearly all firms endeavor to sell accurate thermometers this precaution will sometimes repay the trouble involved. For experimental purposes record the correction at 100°, 103°, 106° F.

Then, with a corrected thermometer and the machine regulated to the proper temperature, put the eggs in, being careful that they are moderately warm from having stood in a warm room for an hour at least. Careful work is now needed to see that the machine varies as little as possible from the proper temperature. A slight variation, however, is not to be feared unless it is of long duration. Do not throw

away a lot of eggs unless certain that they have been spoiled. Test about the 7th and again the 12th day to remove the infertile eggs and the dead germs. With a little practice one will soon learn to test rapidly. Cool the eggs once a day after the second day and until the 18th. Turn twice a day during the same period. It is a matter of considerable interest to know that the hen turns the eggs frequently and moves them about in the nest. After the 18th day do not open the incubator until the hatch is over, then remove the shells and eggs that have not hatched.

BROODING.

FOOD FOR CHICKS.

Neither naturally nor artificially incubated chicks should be fed until forty-eight hours old, when they may be given a mixture of two parts rolled oats and one part hard boiled eggs, chopped fine, including the shells. Or they may be fed two parts dry or stale bread and one part hard boiled egg. If the bread is not perfectly sweet it may be toasted, in fact, it is a good plan to toast the bread anyway. A little burnt or scorched bread is often found beneficial in cases of bowel trouble. Another ration could be made of one part granulated milk, two parts bran and one part corn meal. If sweet skim milk is obtainable they may be fed the bran and meal dry and given milk to drink. A great many different mixtures are used in starting chicks, but hard boiled eggs, mixed with some meal or ground food is usually considered the best ration for the first few meals.

Some do not use the dry mash just described, but prefer a scratch food instead. The scratch food, for the first few days, may consist of the following mixture, viz.: one part millet seed, one part kaffir corn, two parts finely cracked wheat, two parts finely cracked corn, and two parts pin head oats. A number of somewhat similar foods are on the market and generally give satisfaction. The scratch food is fed in a thin litter at first, which is gradually increased as the chicks are enabled to secure the food, until it is about four or five inches deep.

NATURAL BROODING.

If the chicks are to be raised with hens a supply of small coops will be needed. The common inverted V-shaped coop is quite satisfactory in warm weather, or even in cold weather, if it is placed in a sheltered location, or in a shed. The sides forming the roof of this coop should be two feet in length at the peak and three feet long from the peak to the ground on the slope and the angle where the two meet should be about 75°. The back should be boarded up tight. The front should be boarded down about one-third of the way from the top and the remainder slatted. This is probably the most common coop in use in this country.

Another very good coop for hens with chicks in cool weather, con-

sists of a house three feet six inches by four feet two inches. It should be three feet high in front and two feet six inches in the rear. Hinge the front side on as a door which should have a light in it; then board the remainder tight and cover with building paper. The hen may be confined in a crate within and the floor covered with fine litter. This will prevent the hen covering the chicks with chaff when scratching. As soon as the chicks are a week old the crate can be removed as the chicks will then be active enough to keep out of the way.

Early chicks can often be kept in an unused stable or building that is well lighted. A fairly constant temperature aids growth and thus gives more satisfactory results. Later in the season, after the cold winds and rains are over, place the hen and chicks in a small coop out of doors. The coops may be used without floors unless rats are troublesome, in which case they will need perfectly solid floors. The coop should be moved every day or two to prevent killing the grass under it, and secure clean premises.

If hawks and crows are troublesome, a run can be made in front of each coop, using inch mesh wire netting when the danger is great. If the danger of loss from this source is not serious use a two-inch mesh netting to allow the chicks to go through and forage outside. The runs should be moved to fresh ground every few days.

A barrel may be converted into coop for housing a hen and her chicks. Dig a hole in the ground large enough to admit one-third of the barrel. Then place the barrel on its side in the hole and put the earth in it, even with or slightly above that outside. The head should be left intact in one end. Remove the other end and drive stakes in the ground before the opening two inches apart, thus confining the hen and allowing the chicks to pass through. Packing boxes may be used in various ways if covered with building paper, but in general it will be found more satisfactory to build good, substantial coops which can be used for several years.

ARTIFICIAL BROODING.

If chicks are to be reared artificially the brooder should be heated for three or four days before it is to be used. In this way it is dried thoroughly and put in good working order before the chicks are entrusted to it. Cover the floor of the brooder with fine sand and then with clean chaff or finely chopped straw. Clean, sweet hay chaff is excellent for this purpose as the little chicks usually find a great many grass and weed seeds which make excellent food for the first few days.

Care should be exercised not to feed the chicks too heavily at first. This is especially true of brooder chicks, which seem to be lonesome, and will come to meet you every time you go near them. Feel their crops occasionally and if they are not empty withhold food until they are nearly so. Ordinarily young chicks should be fed five times a day, and then only what they will clean up quickly. If any mash food is left at the end of fifteen minutes it should be removed. If too much scratch food is fed at one time be careful to withhold the next feed until the chicks are real hungry. Over feeding or any thing tending to derange the digestive tract may result in serious losses. Keep a constant supply of clean, fresh water and plenty of grit in the form of sharp sand, or broken rock. Charcoal also proves very beneficial when added

to the diet. Both grit and charcoal may be obtained from dealers in poultry supplies; there are at least three sizes of each on the market; in ordering, secure the small size for little chicks. Charcoal may be obtained by sifting wood ashes. If brush or rubbish can be burned so that the chicks have access to the bed of ashes they will soon learn to hunt for charcoal there, and it also serves as an excellent dust bath for them. The mixture of wood ashes and soil seems to suit their wants exactly.

After the chicks are a few days old the hard boiled eggs may gradually be omitted, and a scratch food composed of cracked corn, wheat and pin head oats, substituted. On the average range there is a deficiency of meat and this should be supplied in some form at least until the chicks are a month old, when they are better able to secure insects. The meat then must be fed according to the amount available on the range. At this stage the following mixture may be used, viz.: two parts hulled or pin head oats, two parts wheat, one part cracked corn, and one part beef scrap, or cracked corn and wheat, morning and night, with a dry mash feed at noon, composed of four parts bran, two parts corn meal and two parts beef scrap or granulated milk. In fact there are many combinations of food that may be fed at this time. The main thing is to feed food that will supply bone and muscle forming material to build up good, strong, healthy birds. If insects are abundant no meat need be fed, but if green food is lacking it should be supplied.

After the chicks are a month old it is well to allow them to run to self-feed hoppers and help themselves, or to feed them three times a day on equal parts of pin head oats, wheat and cracked corn morning and night. The feed hopper contains a mash food composed of six parts bran, three parts middlings, three parts corn meal, and beef scrap, according to the amount of insects on the range. Beef scrap would seldom be more than three parts and not often more than one part in the above mixture.

The feed hopper may be made at home or can be bought for a small price from most dealers in poultry supplies. It consists of an arrangement which allows the feed to come down no faster than it is eaten out from below. For the end pieces select a board six feet long and eight inches wide, cut it slantingly across through the center so that the slope will be about one foot long, thus furnishing a frame for a sloping top upon which chickens cannot roost. Board up the back or long side of the end pieces and put the bottom in about three inches above the ground. Put a board four inches wide across the front, thus forming a trough with the bottom. Then cut a board to fit into the hopper at an angle of about 45°, being highest in front to deliver the feed in the trough at a point three inches from the back and four inches from the bottom board; enclose the front from this board up and hinge the cover on. If it is desired to allow the chicks to eat mash feed only at certain times, a board can be hinged over the opening of the trough. The dimensions of this self-feeder must be determined by the number of fowls to be fed from it.

A very good self-feeder used at the Maine Experiment Station is described in Bulletin No. 90, Bureau of Animal Industry, Washington, D. C. "The troughs are from six to ten feet long, with the sides five inches high. The lath slats are two inches apart and the troughs are sixteen inches from floor to roof. The roofs project about two inches at the

sides and effectually keep out rain except when high winds prevail. The roof is very easily removed by lifting one end and sliding it endwise on the opposite gable end on which it rests. The trough can then be filled and the roof drawn back into place without lifting it."

During the whole summer, constant watch must be kept to see that the growing pullets have plenty of shade and water. Neglect these two essentials and they will not fill the egg basket the next winter. If trees are not already in the yards plant them the following spring. Use fruit trees to get both shade for protection and fruit for chicken food and market. Plum and apple trees are excellent for this purpose. Peach trees make a more rapid growth and hence furnish shade quicker. If trees are not to be had, a very good shelter can be made by fastening an old door, or something of the kind, on legs about six inches long on one end and one foot on the other. Chickens do not like to take refuge in the house during the day, and something suitable should be provided to protect them from the sun's rays.

SOME DISEASES OF CHICKS.

GAPES.

This is probably one of the most serious causes of loss among chicks. It is caused by a small worm that accumulates in the windpipe until the chicks suffocate. The affected chicks constantly try to dislodge the worms by gaping and shaking the head. If the chick is quite large it can usually manage to throw off the disease. If, however, the disease attacks small chicks, they usually succumb to it, or become stunted.

There are several ways of treating gapes, but in all cases the first thing to do is to separate the unaffected ones from the rest and move them to fresh ground as the disease spreads rapidly if this precaution is not taken. The common earth worm is said to be a means of spreading the disease as it is very frequently found to be a host for gape worms. If there is danger of gapes, use solid floors in all the coops and keep the chicks confined when there are many earth worms on the surface.

Several patent devices for the treatment of gapes are on the market; some of them are very good for the purpose while others are of doubtful value. If the chicks are considered worth the trouble, the quill and turpentine treatment is probably about the best, and is used as follows: Dip a quill in turpentine and then insert it gently into the wind pipe. The quill must of course enter the wind pipe in order to effect any cure. The operator will see the opening of the wind pipe at the base of the throat. Numerous complaints are made that the treatment does no good because people frequently insert the quill into the gullet instead of the wind pipe.

A looped horse hair may also be used for dislodging the gape worm. Insert it into the wind pipe; give it three or four turns and then remove, after which the chick will cough up any worms that have been dislodged.

Gape worms may be killed by placing the chicks in a closed barrel or some other convenient receptacle and forced to inhale strong tobacco fumes, or those of a similar nature. This method is not recommended very highly, as it is extremely dangerous. The treatment will of course kill the chicks if continued too long and thus an inexperienced operator finds it difficult to use.

In combatting this disease, as well as all others, healthy, growing chicks are much more likely to overcome the trouble than weak, neglected ones.

DIARRHOEA.

Another common disease of chicks is diarrhoea; they are affected with both the white and black forms of this trouble. A lack of heat and an excess of the same are prolific causes of diarrhoea in small chicks, but sometimes improper feeding is the cause. Too much heating food, as corn meal, sloppy, or decaying food, or in fact anything that may cause a derangement of the digestive tract is likely to produce this trouble. Chicks properly hatched from strong, vigorous stock are much more likely to resist the disease, as their organs of digestion are stronger.

LEG WEAKNESS AND CROOKED BREASTS.

This trouble is especially prevalent when chicks are brooded indoors during the cold months. It is often caused by improper feeding. The chicks when thus affected are not getting a proper amount of bone and muscle-forming material and the ration is particularly lacking in ash. This must be supplied in some form to make it palatable. The best way of doing this, so far as known to the writer, is to add fine ground bone either raw or cooked, animal meal, and milk in some form. Milk has been found especially good in supplying this lack of ash in poultry supplies. Feed a mixture of grains as recommended heretofore, and add fine ground bone, animal meal, milk, vegetables, clover or alfalfa, and furnish a plentiful supply of good clean sand or grit. In some cases the ration may have been right and the chicks suffered from a lack of exercise. Without sufficient exercise there will not be a normal development of the digestive organs, bones and muscle. A good, clean range out-of-doors will usually correct this trouble, although if they have started to get crooked breast bones they never can be cured. Crooked breasts are occasionally caused by chicks roosting too early in life, but the trouble is generally caused by improper handling in the early development. Brooder chicks at two weeks of age are sometimes crooked breasted, the result of improper feeding and lack of exercise. Correct the ration as suggested for leg weakness. The digestive organs in birds thus affected are found to be out of proportion to their body weight. This development is probably due to the chick eating too much food, lacking in ash, in the attempt to secure the mineral elements which should be fed in a more concentrated form.

If the chicks are not taking enough exercise and a range is impossible on account of severe weather or other conditions, increase the amount of litter and force the youngsters to spend more time scratching for their food, but do not make the mistake of requiring them to work too much at first, as a chick with muscles and bones already weak, must be built

up gradually. Frequently the attendant discovers that a brood of indoor chicks are getting weak. He is, perhaps, feeding a good supply of green bone and other bone-forming material. He desires, therefore, to make them take more exercise. With this in view he doubles the amount of litter and decreases the food, with the result that the chick in the attempt to satisfy its hunger, works too hard for its bodily strength and fails entirely. Frequently leg weakness is accompanied by constipation, which is relieved by the addition of green food and an increased amount of exercise.

LICE AND MITES.

Other foes of little chicks are external parasites, lice and mites. We frequently find lice even among winter brooder chicks. Lice on the head are most troublesome. They fasten themselves to the back of the chick's head, near the base of the brain and gradually kill the chick. It is a pitiful sight to see the little chick scratching the back of its head trying to dislodge this pest. Good results are usually obtained by greasing the head of each chick with 5 per cent carbolated vaseline. Kerosene and lard, equal parts, prove equally effective. The chicks can be rapidly treated and should be attended to as soon as there is any suspicion of head lice. The louse may be seen readily by means of a small magnifying glass. It can also be detected with the naked eye if one is very careful to examine the right place, although one must look carefully to see it.

To kill mites, clean all coops and brooders perfectly, then apply thoroughly, either white wash, kerosene oil, or some of the prepared insecticides. Be sure to fill all the cracks and crevices as these are the places where mites will be found hiding during the day. Burn all the litter and add new. A spray pump may be used for applying the insecticide, as it drives the liquid into the cracks and crevices better than can be done with a brush. Whitewash can be applied with a pump and then smoothed over with a brush, doing rapid and effective work. Mites differ from body lice in that they suck the blood from the fowls' bodies, while lice have biting mouthparts and live on the skin and feathers, causing intense itching and annoyance. Mites live on the fowl's body at night only, hiding in cracks and crevices during the day. They appear red when gorged with blood, or white when there is little blood in their bodies.

To kill the lice we must treat the hen's or chick's body, as the lice live there practically all the time. There are several kinds of these lice, but they all yield to the same treatment, namely, a good dusting. The dust fills up the breathing pores in their bodies, and thus suffocates them. A good insect powder may be made from equal parts of fine ground tobacco and powdered sulphur. Snuff is also used. There are a number of insect powders on the market and most of them prove very satisfactory. Pyrethrum or Persian insect powder can be purchased at any drug store and if fresh is effective. The essential thing is a finely pulverized substance that will go through the feathers.

Having carefully dusted the chicks (and hens, if the chicks are running with them) clean the houses and remove to clean ground. A good dust bath should be arranged so that the hens and chicks may help keep

themselves clean. An excellent dust bath is made by drawing a load of "chip-dirt" and dumping it in the yard where the little fellows may have ready access to it. For winter use a box partly filled with fine sand, road-dust, land plaster or coal or wood ashes answers very well. A mixture of sand and land plaster seems to please them more than either one alone. Some use wood ashes alone, but a mixture of wood ashes and road dust, or fine sand, makes a heavier bath and therefore more effective in cleaning the lice out of the feathers.

If the fowls or chicks are badly infested, do not depend entirely on a dust bath to rid them of the parasites. Examine them carefully in the day time and if small parasites are found on their bodies, give them a thorough dusting, or if small red or white mites are found about the cracks and crevices of the house and perches, thoroughly treat as described above. Simply because a house has not been used for a long time is no assurance that it is clean. It may be full of vermin even after years of idleness. Keep a constant lookout for vermin, and treat thoroughly when found.

HANDLING YOUNG STOCK.

As soon as the chicks weigh a pound or a pound and a half, the mother should be taken away if she has not already deserted her brood and commenced laying. This is a critical time in the young chick's life, as the youngsters are likely to run from coop to coop just at dusk searching for the warmth of the mother hen. Some prefer to move them to larger coops than those in which they have been raised, thus far, but usually it will be found more satisfactory to leave them in the "chick coops" until they are well weaned from the mother hens. Be careful to keep them from crowding together in a few coops. This crowding is often the cause of weak and almost worthless chickens. If the chicks have not been examined after they are all settled for the night, go from coop to coop and make a careful examination to be sure that there are not too many in one house. If a house is found with a large number in it, run your hand in among them and note the high temperature. You will then understand why this crowding is so dangerous. Also notice the tendency for the chicks to crowd together in the coops that are fed first in the morning. To prevent this, change the order of feeding so they cannot tell which will be the first to be fed at the beginning of each day.

Be careful also that they do not sleep on the ground as this will cause them to sweat. The ground is moist and cool, while their bodies are warm, this causes the feathers to become saturated with moisture. Then when they go out in the early morning they are readily chilled, thus making them unhealthy. The moist, damp atmosphere is also unhealthy for them to breathe during the night.

Perhaps by this time the young males are beginning to annoy the pullets. At the first sign of this approach to maturity the pullets should be removed to other quarters. If a portable house with a good

roof is accessible, draw it out into a nearby meadow or corn field. The sides of the house may be enclosed with wire which should be covered with cloth or burlap on the north and east. This will prevent a direct draught on the chicks. The general trouble with summer houses is from too little rather than too much air, yet a direct draught should be avoided.

The mash feed at this time should be similar to that used earlier. A mash composed of two parts corn meal, one part bran, and one part middlings has been found very satisfactory. This feed may be placed in a self-feed hopper and the pullets allowed to help themselves. They will be able to find plenty of meat in the form of insects on most ranges. A flock of growing pullets will do more to rid a meadow of harmful insects than a lot of such pests as crows, and one will find that even in the corn field they do no harm if properly fed. With a large run they do but very little scratching, as they seem to prefer to run down an insect rather than dig one out of the ground. They will, of course, appropriate a small place for a dust bath unless you furnish them with one.

The house should be constructed so that it can be locked. Leave a place, however, where the pullets may go in and out at will. If they are allowed to do this you will find that about three o'clock in the morning they will come stealing out and scatter over the meadow. The grasshoppers are now sluggish with the cold dew and are readily picked up and devoured. Perhaps the good that the pullets do to the crops has been emphasized more than the good they derive from the open range, but a single trial should convince the most sceptical that the healthiest kind of fowls can be raised in this way.

In case the owner of the fowls lives in a village, so plan your chicken house, yards and garden that the hens can be readily changed from one place to another. As soon as the early vegetables have been removed from one part of the garden, seed the ground to rye. When the rye has made a good start, turn the pullets in and let them dig and scratch all they will. Some may say that this is too much trouble, but those who have tried it are satisfied with the results. One cannot expect to raise strong, healthy chicks on ground that has been poisoned for years by preceding generations of fowls. Plow up the old yard and use it for a garden for a year or two. If it is not too rich it will prove an excellent garden and the old one will be greatly benefitted by a year's rest and fertilization by the droppings from the fowls.

Many people have failed in poultry raising simply because when they increased the number kept they did not increase the size of their houses, yards and runs. For instance a farmer or villager is doing well with thirty hens. He determines to increase the number to one hundred. The next spring he hatches about three times as many as formerly and raises them on the same range. The range probably could be kept sanitary with fifty chicks, but when increased to one hundred and fifty they do not grow strong and vigorous. Before increasing the size of the flock consider the possibilities for greater facilities to accommodate and handle them properly. Provide ample house room to accommodate the increased flock for winter. Each hen should have about five square feet of floor space. Measure the house and see how many hens

should be kept in it and then do not attempt to keep more than the space will allow.

The ability to grow strong, vigorous pullets during the summer is considered the most important factor in winter egg production. Some may not agree with this, and it is surprising the large amount of literature that has been written about winter housing and feeding, all of which is very essential, while but little has been written about the summer and early fall management of pullets. Good houses are costly and from that standpoint should be given much attention, but the great advantage of this system of summer management is that it costs almost nothing—a little extra time and trouble to feed.

If a convenient house for summer is not already available, one may be constructed very cheaply. A summer house to accommodate thirty pullets should be 8x10 feet, with a 6-foot front elevation and 4 feet in the rear. If care is taken to clean this house and keep it so, one may handle as many as forty pullets in it. If the desire is to keep more than forty pullets in a house it should be constructed large enough to give each one at least two square feet. Cheap lumber and building paper will make a serviceable roof; the frame may be cut in the wood lot if necessary, otherwise use 2x4 inch scantling. Cover the sides with wire netting and then with a few cents for cloth or burlap cover the sides and a good summer house is complete. The south side should be left so that the cloth or burlap can be rolled up except when storms come from that direction. Such a house should be placed on two good oak runners with clevises attached so that it can be drawn to any part of the farm. A movable floor should be placed in the house and covered with straw or chaff. This litter should be removed frequently in order to keep the house clean and sanitary. When the pullets are four months old, roosts may be placed inside and they will soon learn to use them.

If birds are to be shown at the fall or winter fairs one will find the pullets that have been raised out in the open where they ranged at will are much stronger, with brighter and more lustrous feathers than those chicks raised in confinement. One of these free range pullets when confined to coops will need a little more training, but will endure a long journey and the strain of the show room much better than the one that has been raised in close confinement on soil that has been poisoned by years of accumulated droppings.

There may be some disadvantages in the free range system for pullets, such as the requirement of extra time and trouble which have already been discussed. There remains, however, the question of hawks, crows, skunks and other vermin, which may be troublesome in some localities. If care is exercised to shut the doors at night and have the opening two feet from the ground there should be no more trouble with any night prowling animals than is likely to occur in a small yard close to the house. Hawks probably are the most troublesome in the day time and should be shot whenever they visit the chicken yard. Crows seldom trouble chickens large enough to put out on the range. Where hawks are quite troublesome a corn field makes an excellent place to keep the pullets as the chicks will usually hide away so that the hawks cannot see them. Those who have tried the free range say that they

find the hawks no more troublesome out in the field than they did near the house.

Illustration number three represents twenty-six White Leghorn pullets reared according to methods outlined in this publication in the last two chapters treating on the Handling of Young Stock and Food, Care and Management of Pullets during the Fall and Winter. Twelve

Illustration 3.

of these pullets were hatched early in May, 1906, and the remaining fourteen during the early part of the following month. On November 30, 1906, the average weight of this pen of pullets was three and one-half pounds. The first egg produced by this pen was laid October 23d, and during the thirty days of November a total of 391 eggs were produced by the pen.

FOOD, CARE AND MANAGEMENT OF PULLETS DURING THE FALL AND WINTER.

When the cold nights begin to come, about November 1st, it is time to bring the pullets into winter quarters. They should then begin to show signs of approaching maturity. Before bringing them in, clean the house they are to occupy, whitewash it thoroughly and disinfect the perches, nest boxes, etc. Be sure that the disinfectant enters every crack and crevice. Then cover the floor with about four inches of fine gravel or sand. Cover this with six inches of dry, clean, long straw, as the pullets will break it up quickly enough. Where leaves are plentiful they may be used and make very satisfactory litter, although they do not last as long as straw.

When the house is ready remove the pullets to it carefully. Do not carry them by one leg only or otherwise misuse them. Any rough handling at this time will mean a subsequent loss in the egg basket. Of course a change always produces timidity, but by exercising great care they will soon become accustomed to their new quarters. When about to enter the house a slight noise announcing one's approach before opening the doors will prevent fright and injury from a sudden rush or flight against obstacles in the pen. Chickens soon get to know the call of a low, soft whistle announcing to them the coming of the feed basket. At this stage the reproductive organs are developing rapidly and any abuse or frightening may cause the loss of some of the finest in the flock.

We have entered poultry houses in the winter where the windows have been closed for days at a time. The hens are found standing around with their feathers ruffled and looking as if they were nearly frozen to death. In accustoming pullets to their new quarters, see that they always have plenty of fresh air without a draught. One of the best systems of ventilation is to have a window hinged on one side and cloth on the other so that either one can be swung in at will. Those having sliding windows can arrange to slide one in from either side. Both should usually be left open a little while during the day except in extremely cold weather. Hens enjoy sunshine and fresh air but it should come through the window and not through cracks and crevices. No one should expect hens to lay well in a house that is not constructed with tight walls. The sides of many hen houses are made of unmatched lumber, which has shrunk, leaving cracks through which wind, rain and snow blow, perhaps directly on the fowls. No one should expect hens to do well in such a place. A few dollars spent on building paper and a few feet of battens will work a great change for the better. Simply spread the building paper smoothly over the sides of the house and then place battens on every eighteen inches. A good coat of paint will improve the appearance, and make it more lasting.

Next let us consider the feed that the pullets should have when they come in off the range. While on the range they doubtless found an abundance of green food and meat in the form of grass and insects.

We must supply these two foods when the pullets are confined to the laying houses. If we can secure skim milk at a reasonable price, or have it on the farm it will be found to be an excellent food. Very often one can buy green bone and scraps or waste meat from the markets at a reasonable price. Any of these may be utilized as well as scraps from the table, as long as they are fresh. No one should be guilty of feeding partially decayed meat in any form. We cannot expect people to pay good prices for eggs if our fowls eat unclean food. In some instances the hens are fed the meat from any animal that dies; this practice should not be allowed. Numerous complaints are made annually because even fresh eggs are off in flavor. When the source of the trouble is traced out we invariably find the hens have been fed unclean food, such as hotel swill, horse meat, or other carrion. If milk or meat scraps cannot be secured locally it is better to buy commercial beef-scrap or granulated milk. These will keep indefinitely when properly stored.

The green food may be supplied in the form of cut alfalfa or clover hay. The hens will eat it either dry or steamed. Mangolds or beets and cabbage also make excellent food and should be fed raw. Beets should be sliced lengthways until the hens learn to eat them, when they may be thrown in whole. The mangel-wurtzel is the best variety for chicken feed. The cabbage should be hung up on a string where the hens can get exercise working at it. Onions, turnips, potatoes and several other vegetables may be fed. These, however, should be cooked until soft and then mixed with about an equal bulk of bran; feed while still quite warm. We prefer to feed such a feed at noon. Be careful not to feed too much, as the hens are very fond of soft, moist mash, and will engorge themselves with it if given a chance. Be sure that each hen can get her share and do not feed more than they will eat up clean in fifteen minutes. Also be careful to have the vegetables dry enough so that when the bran is added it will make a crumbly, moist mixture.

Always be careful to feed clean food of all kinds, and shun all bad smelling disinfectants. The egg shell is porous and will, therefore, allow the egg to absorb bad odors. Store the eggs in a clean place and market them at least once a week; by following this method one should soon be able to get a reputation for furnishing eggs that are good and genuinely fresh.

When the pullets are brought in from the range they may not be completely feathered. If not, an occasional feed of sweet corn will be a great treat for them and will help them produce a new coat of feathers. Sunflower seeds contain oil and make an excellent addition to the ration, helping to produce new feathers quickly. Oil meal or oil cake may also be added to the mash feed. We like to use 100 pounds bran, 75 pounds middlings, 25 pounds oil meal, 100 pounds corn meal and 100 pounds beef-scrap. Canada peas also make an excellent addition to the ration during the moulting period. The fowls soon learn to eat them and they will help keep the birds vigorous during the strain of the moulting period.

There is as much in care and management as in the food. Keep the hens busy all day and then give them enough to fill the crops at night. In this way one can have healthy fowls and avoid many bad habits. If a hopper is used to feed mash, supply a light feed of grain in the

litter in the morning; stir it in well so they have to work to find it. At noon open the hopper and let them help themselves until about four o'clock, when it should be closed and the hens fed an abundant feed of grain. If some grain is left in the litter they will search it out the next morning. If moist mash is fed it should be given at noon and then in moderation as the hens are very fond of warm, crumbly mash in cold weather, and may engorge their crops if fed too much. Aim to have a constant supply of fresh water. Do not allow the fowls to get too hungry but endeavor to keep them comfortable, busy and contented. By strict adherence to these rules one should be able to make the strong, vigorous pullets lay well all the fall and winter.

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